



April 04, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission  
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**SUBJECT:** NuScale Power, LLC Response to NRC Request for Additional Information No. 367 (eRAI No. 9365) on the NuScale Design Certification Application

**REFERENCE:** U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 367 (eRAI No. 9365)," dated February 08, 2018

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) response to the referenced NRC Request for Additional Information (RAI).

The Enclosure to this letter contains NuScale's response to the following RAI Question from NRC eRAI No. 9365:

- 19-38

This letter and the enclosed response make no new regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions on this response, please contact Darrell Gardner at 980-349-4829 or at [dgardner@nuscalepower.com](mailto:dgardner@nuscalepower.com).

Sincerely,

A handwritten signature in black ink, appearing to read "Zackary W. Rad".

Zackary W. Rad  
Director, Regulatory Affairs  
NuScale Power, LLC

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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9365



**Enclosure 1:**

NuScale Response to NRC Request for Additional Information eRAI No. 9365

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## Response to Request for Additional Information Docket No. 52-048

**eRAI No.:** 9365

**Date of RAI Issue:** 02/08/2018

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### **NRC Question No.:** 19-38

10 CFR 52.47(a)(27) states that a design certification application (DCA) must contain a Final Safety Analysis Report (FSAR) that includes a description of the design-specific probabilistic risk assessment (PRA) and its results. The staff uses guidance contained in SRP Chapter 19.0 Revision 3, “Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors,” and design certification/combined operating license (DC/COL) interim staff guidance (ISG)20, “Implementation of a Probabilistic Risk Assessment-Based Seismic Margin Analysis for New Reactors.” SRP Chapter 19.0 provides guidance for reviewing the PRA- based Seismic Margin Assessment (SMA) submitted in support of a DC or COL application. DC/COL-ISG-20 discusses post-DC activities to update the PRA-based SMA throughout the licensing process of new reactors, including COL action items and post-licensing activities, to ensure a coherent and consistent process for the quality of PRA-based SMA to adequately meet Title 10 of the *Code of Federal Regulations* (10 CFR) 52.47(a)(27), 10 CFR 52.79(a)(46), 10 CFR 52.79(d)(1), and 10 CFR 50.71(h). Specifically, the staff reviewed whether:

“The assumptions made in the applicant’s PRA during design development and certification, in which a specific site may not have been identified or all aspects of the design (e.g., balance of plant) may not have been fully developed, are identified in the DC [design certification] application and either remain valid or are adequately addressed within the COL [combined license] application.” The DC PRA- based SMA and insights rely on key assumptions that need to be appropriately evaluated and dispositioned during the COL phases to ensure that the PRA-based SMA and insights continue to remain valid.

In the response to request for additional information (RAI) 8899, Question 19.01- 18, NuScale indicated that COL Items 19.1-7 and 19.1-8 are sufficient to update the SMA to reflect the as-built configuration.

The staff reviewed COL Item 19.1-7, which states that: “A COL applicant that references the NuScale Power Plant design certification will evaluate site-specific external event hazards, screen those for risk-significance, and evaluate the risk associated with external hazards that are not bounded by the design certification.” Based on its review, for the seismic hazard, the staff has determined that a COL applicant should confirm that the site-specific seismic hazard is bounded by the design certification and update the PRA-based SMA to include site specific (e.g.

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soil liquefaction and slope failure) and plant-specific information for the site. The existing docketed action statement does not provide adequate guidance to ensure that the results of the PRA-based SMA remain valid and reflect the site-specific (e.g., soil liquefaction and slope failure) and plant-specific information for the site.

The staff also reviewed COL Item 19.1-8, which states that: “A COL applicant that references the NuScale Power Plant design certification will confirm the applicability of assumptions and data and modify as necessary for the to the [sic] as-built/as-operated probabilistic risk assessment”. Based on its review, the staff has determined that a COL must perform a seismic walkdown to meet the intent of COL Item 19.1-8 for PRA-based SMA assumptions. The existing docketed action statement does not provide adequate guidance (i.e., to perform a seismic walkdown) to ensure that key SMA assumptions, including those identified in FSAR Table 19.1-40 will be appropriately evaluated and dispositioned during the COL phases.

Additionally the response to RAI 8854, Question 19-4, specifically the markups to FSAR Section 19.1.5.1.1.5, “Effects of Seismically Failed SSCs on Surviving [systems, structures and components (SSCs)],” describes the potential for physical interaction between non-seismic Category I SSC and seismic Category I SSC. The FSAR needs to address verification by the COL applicant that site-specific or plant- specific updates do not impact the results of the PRA-based SMA or high confidence low probability of failure (HCLPF) values.

Therefore, the staff requests the applicant to revise the current COL items or provide new COL items addressing the aforementioned aspects which are to be verified by the COL applicant.

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### **NuScale Response:**

As stated in FSAR Section 19.1.5.1.1.1, the seismic margin analysis (SMA) was performed in accordance with interim staff guidance document DC/COL-ISG-020. This ISG provides regulatory guidance for performing an SMA in support of a design certification application (DCA) and post-DCA activities including combined license (COL) updates to incorporate site and plant-specific features and post-COL verifications. DC/COL-ISG-020 explicitly specifies activities that must be performed to ensure that the SMA performed for design certification remains valid and reflects site and plant-specific information if the COL application incorporates the design certification by reference; site-specific seismic effects that must be evaluated include liquefaction, slope failure, supporting structure interaction, and update of the high confidence of low probability of failure (HCLPF) values. DC/COL-ISG-020 addresses the need for a plant walkdown of the as-designed, as-built configuration. DC/COL-ISG-020 also refers to ESP/DC/COL-ISG-015, which identifies the requirements that a COL applicant needs to meet to demonstrate compliance with 10 CFR Part 52, “Subpart C - Combined License”.

As indicated in the NuScale response to RAI 9151, provided by NuScale letters RAIO-1117-57303 (dated November 21, 2017) and RAIO-0318-58993 (dated March 2, 2018), the COL items in Chapter 19 are written at a summary level to identify the major COL activities



associated with developing a PRA to support an as-built, as-operated facility. In addition to the specific COL items identified in the FSAR, development of an acceptable COL is based on regulatory requirements, such as 10 CFR 52.79(46), regulatory guidance documents, such as DC/COL-ISG-020, and industry standards, such as ASME-ANS Ra-Sa-2009. Because regulatory guidance documents and industry standards identify the required site-specific updates if a COL applicant references the design certification, analogous COL items are unnecessary.

Based on this perspective, NuScale believes that the current level of detail is appropriate for COL items and that the site-specific seismic effects identified in the RAI are encompassed by COL Items 19.1-7 and 19.1-8. Note that to clarify the intent of COL Item 19.1-7, soil liquefaction and slope failure have been added as examples of site-specific external hazards that must be addressed by a COL applicant. The acceptability of COL item closure with respect to regulatory requirements and guidance will be assessed during the staff's review of the COL application.

**Impact on DCA:**

COL Item 19.1-7 has been revised as described in the response above and as shown in the markup provided in this response.

RAI 01-61, RAI 02.04.13-1, RAI 03.04.02-1, RAI 03.04.02-2, RAI 03.04.02-3, RAI 03.05.01.04-1, RAI 03.05.02-2, RAI 03.06.02-15, RAI 03.06.03-11, RAI 03.07.01-2, RAI 03.07.01-3, RAI 03.07.02-8, RAI 03.07.02-12, RAI 03.08.04-23S1, RAI 03.08.05-14S1, RAI 03.09.02-15, RAI 03.09.02-48, RAI 03.09.03-12, RAI 03.09.06-5, RAI 03.09.06-6, RAI 03.09.06-16, RAI 03.09.06-16S1, RAI 03.09.06-27, RAI 03.11-8, RAI 03.11-14, RAI 03.11-14S1, RAI 03.13-3, RAI 05.04.02.01-13, RAI 05.04.02.01-14, RAI 06.04-1, RAI 09.01.02-4, RAI 09.01.05-3, RAI 09.01.05-6, RAI 09.03.02-3, RAI 09.03.02-4, RAI 09.03.02-5, RAI 09.03.02-6, RAI 09.03.02-8, RAI 10.02-1, RAI 10.02-2, RAI 10.03.06-1, RAI 10.03.06-5, RAI 10.04.06-1, RAI 10.04.06-2, RAI 10.04.06-3, RAI 10.04.10-2, RAI 13.01.01-1, RAI 13.01.01-1S1, RAI 13.02.02-1, RAI 13.03-4, RAI 13.05.02.01-2, RAI 13.05.02.01-2S1, RAI 13.05.02.01-3, RAI 13.05.02.01-3S1, RAI 13.05.02.01-4, RAI 13.05.02.01-4S1, RAI 14.02-7, RAI 19-31, RAI 19-31S1, RAI 19-38

**Table 1.8-2: Combined License Information Items**

<b>Item No.</b>	<b>Description of COL Information Item</b>	<b>Section</b>
COL Item 1.1-1:	A COL applicant that references the NuScale Power Plant design certification will identify the site-specific plant location.	1.1
COL Item 1.1-2:	A COL applicant that references the NuScale Power Plant design certification will provide the schedules for completion of construction and commercial operation of each power module.	1.1
COL Item 1.4-1:	A COL applicant that references the NuScale Power Plant design certification will identify the prime agents or contractors for the construction and operation of the nuclear power plant.	1.4
COL Item 1.7-1:	A COL applicant that references the NuScale Power Plant design certification will provide site-specific diagrams and legends, as applicable.	1.7
COL Item 1.7-2:	A COL applicant that references the NuScale Power Plant design certification will list additional site-specific piping and instrumentation diagrams and legends as applicable.	1.7
COL Item 1.8-1:	A COL applicant that references the NuScale Power Plant design certification will provide a list of departures from the certified design.	1.8
COL Item 1.9-1:	A COL applicant that references the NuScale Power Plant design certification will review and address the conformance with regulatory criteria in effect six months before the docket date of the COL application for the site-specific portions and operational aspects of the facility design.	1.9
COL Item 1.10-1:	A COL applicant that references the NuScale Power Plant design certification will evaluate the potential hazards resulting from construction activities of the new NuScale facility to the safety-related and risk significant structures, systems, and components of existing operating unit(s) and newly constructed operating unit(s) at the co-located site per 10 CFR 52.79(a)(31). The evaluation will include identification of management and administrative controls necessary to eliminate or mitigate the consequences of potential hazards and demonstration that the limiting conditions for operation of an operating unit would not be exceeded. This COL item is not applicable for construction activities (build-out of the facility) at an individual NuScale Power Plant with operating NuScale Power Modules.	1.10
COL Item 2.0-1:	A COL applicant that references the NuScale Power Plant design certification will demonstrate that site-specific characteristics are bounded by the design parameters specified in Table 2.0-1. If site-specific values are not bounded by the values in Table 2.0-1, the COL applicant will demonstrate the acceptability of the site-specific values in the appropriate sections of its combined license application.	2.0
COL Item 2.1-1:	A COL applicant that references the NuScale Power Plant design certification will describe the site geographic and demographic characteristics.	2.1
COL Item 2.2-1:	A COL applicant that references the NuScale Power Plant design certification will describe nearby industrial, transportation, and military facilities. The COL applicant will demonstrate that the design is acceptable for each potential accident, or provide site-specific design alternatives.	2.2
COL Item 2.3-1:	A COL applicant that references the NuScale Power Plant design certification will describe the site-specific meteorological characteristics for Section 2.3.1 through Section 2.3.5, as applicable.	2.3
COL Item 2.4-1:	A COL applicant that references the NuScale Power Plant design certification will investigate and describe the site-specific hydrologic characteristics for Section 2.4.1 through Section 2.4.14, as applicable.	2.4
COL Item 2.5-1:	A COL applicant that references the NuScale Power Plant design certification will describe the site-specific geology, seismology, and geotechnical characteristics for Section 2.5.1 through Section 2.5.5, below.	2.5
COL Item 3.2-1:	A COL applicant that references the NuScale Power Plant design certification will update Table 3.2-1 to identify the classification of site-specific structures, systems, and components.	3.2

Table 1.8-2: Combined License Information Items (Continued)

Item No.	Description of COL Information Item	Section
COL Item 17.4-3:	A COL applicant that references the NuScale Power Plant design certification will identify the quality assurance controls for the Reliability Assurance Program structures, systems, and components during site-specific design, procurement, fabrication, construction, and preoperational testing activities.	17.4
COL Item 17.5-1:	A COL applicant that references the NuScale Power Plant design certification will describe the quality assurance program applicable to site-specific design activities and to the construction and operations phases.	17.5
COL Item 17.6-1:	A COL applicant that references the NuScale Power Plant design certification will describe the program for monitoring the effectiveness of maintenance required by 10 CFR 50.65.	17.6
COL Item 18.5-1:	A COL applicant that references the NuScale Power Plant design certification will address the staffing and qualifications of non-licensed operators.	18.5
COL Item 18.12-1:	A COL applicant that references the NuScale Power Plant design certification will provide a description of the human performance monitoring program in accordance with applicable NUREG-0711 or equivalent criteria.	18.12
COL Item 19.1-1:	A COL applicant that references the NuScale Power Plant design certification will identify and describe the use of the probabilistic risk assessment in support of licensee programs being implemented during the COL application phase.	19.1
COL Item 19.1-2:	A COL applicant that references the NuScale Power Plant design certification will identify and describe specific risk-informed applications being implemented during the COL application phase.	19.1
COL Item 19.1-3:	A COL applicant that references the NuScale Power Plant design certification will specify and describe the use of the probabilistic risk assessment in support of licensee programs during the construction phase (from issuance of the COL up to initial fuel loading).	19.1
COL Item 19.1-4:	A COL applicant that references the NuScale Power Plant design certification will specify and describe risk-informed applications during the construction phase (from issuance of the COL up to initial fuel loading).	19.1
COL Item 19.1-5:	A COL applicant that references the NuScale Power Plant design certification will specify and describe the use of the probabilistic risk assessment in support of licensee programs during the operational phase (from initial fuel loading through commercial operation).	19.1
COL Item 19.1-6:	A COL applicant that references the NuScale Power Plant design certification will specify and describe risk-informed applications during the operational phase (from initial fuel loading through commercial operation).	19.1
COL Item 19.1-7:	A COL applicant that references the NuScale Power Plant design certification will evaluate site-specific external event hazards (e.g., liquefaction, slope failure), screen those for risk-significance, and evaluate the risk associated with external hazards that are not bounded by the design certification.	19.1
COL Item 19.1-8:	A COL applicant that references the NuScale Power Plant design certification will confirm the validity of the "key assumptions" and data used in the design certification application PRA and modify, as necessary, for applicability to the as-built, as-operated <del>probabilistic risk assessment</del> PRA.	19.1
COL Item 19.2-1:	A COL applicant that references the NuScale Power Plant design certification will develop severe accident management guidelines and other administrative controls to define the response to beyond-design-basis events.	19.2
COL Item 19.2-2:	A COL applicant that references the NuScale Power Plant design certification will use the site-specific probabilistic risk assessment to evaluate and identify improvements in the reliability of core and containment heat removal systems as specified by 10 CFR 50.34(f)(1)(i).	19.2
COL Item 19.2-3:	A COL applicant that references the NuScale Power Plant design certification will evaluate severe accident mitigation design alternatives screened as "not required for design certification application."	19.2
COL Item 19.3-1:	A COL applicant that references the NuScale Power Plant design certification will identify site-specific regulatory treatment of nonsafety systems (RTNSS) structures, systems, and components and applicable RTNSS process controls.	19.3

plant conditions and functions regardless of whether the scenario was caused by an internal initiating event or if an external event has occurred. The CNTS is protected from external events through the design of the system as well as protection provided by the structures in which it located. Therefore, the general insights summarized above are equally applicable to external events as well as internal events.

Table 19.1-32 summarizes these insights.

#### **19.1.4.3 Level 3 Internal Events Probabilistic Risk Assessment for Operations at Power**

The PRA Level 3 analysis is used to evaluate offsite consequences at a potential site. A Level 3 analysis has not been performed for design certification.

#### **19.1.5 Safety Insights from the External Events Probabilistic Risk Assessment for Operations at Power**

The external event hazards that may affect the NuScale risk profile are identified based on past studies and in a manner consistent with the requirements of ASME/ANS RA-Sa-2009. Once the hazards are identified for consideration, the guidance in ASME/ANS RA-Sa-2009 is used to implement a progressive screening process to identify which external events could be screened from detailed evaluation and those that required a quantitative hazard evaluation. The screening criteria are presented in Table 19.1-33. The table provides preliminary and bounding screening criteria using the approach discussed in Part 6 of ASME/ANS RA-Sa-2009.

Table 19.1-34 summarizes the external hazards identified for consideration in the NuScale PRA for operations at power. The table provides the screening disposition for each of the hazards.

The screening of some hazards was based on assumptions regarding siting requirements. A bounding analysis of high winds and external floods was performed and site characteristics should be compared to those assumed in the bounding analyses to ensure that the site is enveloped. The seismic hazard has been addressed by performing a seismic margins assessment. The external events that are not site-specific are internal fires and internal floods.

Section 19.1.5.1 through Section 19.1.5.5 address seismic, internal fire, internal flood, external flood and high-winds hazards, respectively.

RAI 19-38

COL Item 19.1-7: A COL applicant that references the NuScale Power Plant design certification will evaluate site-specific external event hazards ([e.g., liquefaction, slope failure](#)), screen those for risk-significance, and evaluate the risk associated with external hazards that are not bounded by the design certification.